

What is claim is:

1. A sheet capacitor comprising:

a contact portion formed in a through-hole requiring electrical connection with an IC connection pin among the through-holes in which the IC connection pins are
5 inserted, and

a capacitor element connected to the contact portion.

2. The sheet capacitor of claim 1, further comprising:

a board having the contact portion and mounting the capacitor element.

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3. The sheet capacitor of claim 1, further comprising:

a conductive negative sheet having the through-hole and the contact portion,

a conductive positive sheet having the through-hole and the contact portion,

and

15 a first insulating layer disposed between the negative sheet and the positive sheet,

wherein a negative electrode and a positive electrode of the capacitor element are connected to the negative sheet and the positive sheet respectively.

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4. The sheet capacitor of claim 3, further comprising:

an insulating packaging member coating at least a part of the outer surface in an integrally laminated and bonded state of the negative sheet, the first insulating layer and the positive sheet.

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5. The sheet capacitor of claim 4,

wherein the packaging member has an opening for allowing a test pin to contact directly with the negative sheet and the positive sheet.

6. The sheet capacitor of claim 3,

5 wherein a reinforcing wall is provided in a peripheral part of at least one of the negative sheet and the positive sheet.

7. The sheet capacitor of claim 3,

10 wherein a plurality of laminated bodies having the first insulating layer, the negative sheet, the positive sheet and the capacitor element are provided by lamination.

8. The sheet capacitor of claim 7, further comprising:

a second insulating layer disposed between the laminated bodies.

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9. The sheet capacitor of claim 7,

wherein the individual capacitor elements included in the laminated bodies are different at least in type or characteristic.

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10. The sheet capacitor of claim 3,

wherein an opening is disposed in at least one of the negative sheet and the positive sheet and in the insulating layer, and the capacitor element is disposed in the opening.

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11. The sheet capacitor of claim 3,

wherein the negative sheet and the first insulating layer are disposed by two pieces each, and the two negative sheets are disposed on both sides of the positive sheet via the first insulating layers.

5 12. The sheet capacitor of claim 11,
wherein the end faces of the two negative sheets electrically conduct with each other.

10 13. The sheet capacitor of claim 3, further comprising:
a third insulating layer for covering a portion of the negative sheet
excluding the through-hole and the contact portion.

15 14. The sheet capacitor of claim 1,
wherein the contact portion is formed in an elliptical shape having a major
diameter longer than a diameter of the connection pin, and a minor diameter shorter
than the diameter of the connection pin.

20 15. The sheet capacitor of claim 14,
wherein a pair of slits are provided at both sides in the minor diameter
direction of the contact portion.

25 16. The sheet capacitor of claim 1,
wherein the contact portion is formed in a stellate shape having a maximum
diameter longer than a diameter of the connection pin, and a minimum diameter
shorter than the diameter of the connection pin.

17. The sheet capacitor of claim 1,
wherein a recess is formed in the center, and the capacitor element is disposed
in the recess.

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18. The sheet capacitor of claim 1, comprising:
a main body composed of the sheet capacitor,
a slide plate having a through-hole larger than the connection pin disposed
corresponding to the through-hole of the main body, being disposed slidably on the
board, and

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a thrusting member for thrusting at least one of the main body and the slide
plate so as to pinch the connection pins by the through-holes provided in the slide
plate and the contact portion of the main body.

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19. The sheet capacitor of claim 19,
wherein the contact portion is elastic in the sliding direction of the slide plate.

20. The sheet capacitor of claim 3,

wherein at least one of the positive sheet and the negative sheet is elastic, and

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the contact portion includes a semicircular through-hole for fitting the
connection pin and slits adjacently to the semicircular through-hole.

21. The sheet capacitor of claim 3,

wherein at least one of the positive sheet and the negative sheet is elastic, and

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the contact portion includes a through-hole having an internal foiled

protrusion for insertion of the connection pin.

22. A sheet capacitor comprising:

a first land for connection with an IC on the upper side,

5 a second land for connection with a printed circuit board on the lower side, and
a capacitor element connected to at least one of the first land and the second
land.

23. The sheet capacitor of claim 22, further comprising:

10 an insulating board having the first land and the second land, and mounting the
capacitor element.

24. The sheet capacitor of claim 23,

wherein the insulating board includes a first insulating board mounting the
15 capacitor element at the lower side, and a second insulating board having a notch for
fitting the capacitor element at the upper side with a thickness of larger than the
height of the capacitor element, and

an insulator for covering the capacitor element is further provided.

20 25. The sheet capacitor of claim 23,

wherein the insulating board is substantially in the same shape as the IC, and
the first and second lands corresponds to a connection land provided in the IC.

26. The sheet capacitor of claim 22,

25 wherein a solder ball is provided at least in one of the first land and the second

land.

27. A sheet capacitor comprising: /

a positive sheet having a positive electrode on one side,

5 a negative sheet having a negative electrode on one side,

an electrolyte solution disposed between the positive electrode and the negative electrode, and

a sealing sheet for sealing the electrolyte, disposed between the positive sheet and the negative sheet, and integrally bonded to the positive sheet and the negative

10 sheet.

28. The sheet capacitor of claim 27,

wherein the positive electrode is composed of a positive foil,

the negative electrode is composed of a negative foil,

15 a separator impregnated in the electrolyte is further disposed between the positive electrode and the negative electrode, and

an opening is provided in the sealing seat for fitting the positive electrode, the separator, and the negative electrode.

20 29. The sheet capacitor of claim 27,

wherein the positive sheet is made of an aluminum foil, the positive electrode is formed by etching a part of one side of the positive sheet and chemically treating the etched part,

the negative sheet is made of an aluminum foil, the negative electrode is
25 formed by etching a part of one side of the negative sheet,

a separator impregnated in the electrolyte is further disposed between the positive electrode and the negative electrode, and

an opening is provided in the sealing seat for fitting the positive electrode, the separator, and the negative electrode.

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30. The sheet capacitor of claim 27,

wherein the positive electrode is composed of a positive foil,

the negative electrode is composed of a negative foil,

a substantially spherical spacer mixed in the electrolyte is further disposed, and

10 an opening is provided in the sealing seat for fitting the positive electrode, the electrolyte, and the negative electrode.

31. The sheet capacitor of claim 27,

wherein the positive sheet and the negative sheet have through-holes for fitting

15 connection pins for an IC, and contact portion is provided in a through-hole electrically connected to one of the the connection pins out of the through-holes.

32. The sheet capacitor of claim 27, further comprising:

connectors having through-holes for fitting connection pins for an IC, and a

20 contact portion provided in a through-hole electrically connected to one of the connection pins out of the through-holes, the connectors being electrically connected to the positive sheet and the negative sheet, respectively.

33. The sheet capacitor of claim 27,

25 wherein the positive sheet and the negative sheet are composed of an elastic

conductive metal coated with one of gold plating and an insulating coating at least in a portion contacting with the electrolyte, except for the negative electrode and the positive electrode.

5 34. The sheet capacitor of claim 32,

wherein the positive sheet, the negative sheet, and the connectors are composed of an elastic conductive metal coated with one of gold plating and an insulating coating at least in a portion contacting with the electrolyte, except for the negative electrode and the positive electrode.

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35. The sheet capacitor of claim 28,

wherein the positive foil, the negative foil, and the separator are provided in a plurality, and each of the separators is alternately laminated individually between the positive foil and the negative foil.

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36. The sheet capacitor of claim 27,

wherein the electrolyte is gelatinous.

37. The sheet capacitor of claim 27,

20 wherein a recess is formed in the center, and the positive electrode, the negative electrode and the electrolyte are disposed in the recess.

38. The sheet capacitor of claim 27, further comprising:

an insulating layer covering an outer surface of the capacitor.

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39. The sheet capacitor of claim 3,

wherein the negative sheet has a negative foil including the contact portion of the negative sheet, the positive sheet has a positive foil including the contact portion of the positive sheet,

5 a separator impregnated in the electrolyte is disposed between the positive foil and the negative foil, the negative foil, the positive foil and the separator are combined to compose the capacitor element, and

the insulating layer has an opening for fitting the separator, and is disposed between the positive foil and the negative foil, and composes a sealing sheet for
10 sealing the separator and integrally bonding the positive foil and the negative foil.

40. The sheet capacitor of claim 27,

wherein the positive sheet includes:

an positive foil forming the positive electrode,

15 an insulating sheet laminated at one side of the positive foil by uncovering at least a part of a peripheral edge of the positive foil, and

an positive connection terminal exposing the positive foil,

the negative sheet includes:

a negative foil forming the negative electrode,

20 an insulating sheet laminated at one side of the negative foil by uncovering at least a part of a peripheral edge of the negative foil, and

a negative connection terminal exposing the negative foil,

a separator impregnated in the electrolyte is disposed between the positive foil and the negative foil, and

25 an opening for fitting the separator is provided in the sealing sheet.

41. The sheet capacitor of claim 40, further comprising:

an positive connector having a contact portion provided in a through-hole for fitting and connecting a connection pin of an IC, made of an elastic conductor, and
5 connected electrically to the positive connection terminal, and

a negative connector having a contact portion provided in a through-hole for fitting and connecting another connection pin of the IC, made of an elastic conductor, and connected electrically to the negative connection terminal.

10 42. The sheet capacitor of claim 1, further comprising:

an positive cover having an positive foil in the center of one side, made of a conductive elastic metal including the through-hole and the contact portion,

a negative cover having a negative foil in the center of one side, made of a conductive elastic metal including the through-hole and the contact portion, and

15 a separator impregnated in electrolyte, disposed between the positive foil and the negative foil, and formed smaller than the positive foil and the negative foil, thereby composing the capacitor element by the positive foil, the negative foil and the separator,

wherein the insulating layer has an opening for fitting the separator, and a
20 through-hole for fitting the connection pin, and is disposed between the positive foil and the negative foil and between the positive cover and the negative cover, and composes a sealing sheet for sealing the separator, and integrally bonds the positive foil and the negative foil and the positive cover and the negative cover.

25 43. The sheet capacitor of any one of claims 39 to 42,

wherein the positive foil, the negative foil, and the separator are provided in a plurality, and each of the separators is alternately laminated individually between the positive foil and the negative foil.

5 44. The sheet capacitor of any one of claims 39 to 42,
 wherein one of substantially cross-shaped slit and substantially Y-shaped slit
 is provided in at least one of the positive foil and the negative foil,
 an elastic insulating sheet having an opening larger than a diameter of the
 connection pin in a portion corresponding to the slit is adhered to at least one of the
 10 positive foil and the negative foil where the slit is provided, thereby forming the
 contact portion.

 45. An IC socket for connecting an IC to a printed wiring board, the IC socket
 comprising:

15 a slide portion mounting a sheet capacitor, including:
 a contact portion formed in a first through-hole requiring electrical
 connection with a connection pin, out of first through-holes fitting connection pins
 of the IC, and
 a capacitor element connected to the contact portion,
 20 a bracket portion having second through-holes for fitting the connection pins,
 including a fixed contact point formed in a second through-hole requiring electrical
 connection with a connection pin, out of the second through-holes, and a wiring
 pattern including the fixed contact point, being bonded to the printed wiring board,
 and
 25 a drive mechanism disposed in the bracket portion for sliding the slide portion

on the bracket portion.

46. The IC socket of claim 45,

wherein the sheet capacitor further comprises:

5 a conductive negative sheet including the through-hole and the contact portion,

 a conductive positive sheet including the through-hole and the contact portion, and

 a first insulating layer disposed between the negative sheet and the
10 positive sheet,

 thereby connecting a negative electrode and a positive electrode of the capacitor element to the negative sheet and the positive sheet respectively, and

 the slide portion further includes an insulating packaging member covering at least part of the outer surface in a integrally laminated state of the negative sheet,
15 the positive sheet and the first insulating sheet.

47. The IC socket of claim 46,

wherein at least one of the negative sheet and the positive sheet is elastic, and

 the contact portion includes a semicircular through-hole for fitting the
20 connection pin, and a slit adjacently to the semicircular through-hole.

48. The IC socket of claim 46,

wherein at least one of the negative sheet and the positive sheet is elastic, and

 the contact portion includes a through-hole having an internal folded
25 protrusion for inserting the connection pin.

49. A manufacturing method of a sheet capacitor comprising a conductive negative sheet including through-holes for fitting connection pins of an IC, and a contact portion formed in a through-hole requiring electrical connection with a connection pin out of the through-holes, a conductive positive sheet including a contact portion formed in a through-hole requiring electrical connection with a connection pin out of the through-holes, a first insulating layer disposed between the negative sheet and the positive sheet, and a first capacitor element connected to the negative sheet and the positive sheet, the method comprising steps of:

disposing the first insulating layer having relief through-holes formed in the contact-free fitting portions of all the IC connection pins, between the face side of the negative sheet having relief through-holes larger than an outer diameter of the connection pins formed in the portions not contacting with the connection pins and the positive sheet,

laminating the negative sheet, the insulating sheet and the positive sheet in the matched state of the individual relief through-holes, and

forming the contact portion integrally with the negative sheet and the positive sheet at the same time.

50. The manufacturing method of a sheet capacitor of claim 49, further comprising a step of:

forming a recess by pressing at least in a part excluding the portion forming the relief through-holes and the contact portion before forming the contact portion in the negative sheet and the positive sheet.

51. The manufacturing method of sheet capacitor of claim 49, further comprising steps of:

connecting the first capacitor element to the negative sheet and the positive sheet after forming the contact portion in the negative sheet and the positive sheet,

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sealing the first capacitor element by a second insulating layer, in one of vacuum and inert gas atmosphere.

52. The manufacturing method of a sheet capacitor of claim 49,

10 wherein an insulating paint cured by one of heat and UV is printed, thereby forming the first insulating layer, and adhering the negative sheet and the positive sheet by the first insulating layer at the step of disposing the first insulating layer.

53. The manufacturing method of a sheet capacitor of claim 49,

15 wherein the first insulating layer is formed by using a heat reversible insulating sheet, and the negative sheet and the positive sheet are heated and thermally adhered to the insulating sheet at the step of disposing the first insulating layer.

20 54. The manufacturing method of a sheet capacitor of claim 49,

wherein the first insulating layer is formed by using a heat reversible insulating sheet, and the negative sheet and the positive sheet are heated ultrasonically, and adhered to the insulating sheet at the step of disposing the first insulating layer.

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55. The manufacturing method of a sheet capacitor of claim 49,

wherein the relief through-holes in the negative sheet and the positive sheet are larger than the relief through-holes in the first insulating layer, and the contact portion provided in the negative sheet and the positive sheet are smaller than the relief through-holes provided in the first insulating layer.

56. The manufacturing method of a sheet capacitor of claim 49, further comprising a step of:

adding the first insulating layer and the positive sheet, laminating to the back side of the negative sheet, and connecting a second capacitor element having a different characteristic from the first capacitor element.

57. The manufacturing method of a sheet capacitor of claim 49,

wherein openings are formed in one of the positive sheet and the negative sheet, and in the center of the insulating sheet, and the capacitor element is disposed in the openings.